"There's too many variables. It's fishing. It's the ocean. We just don't know. It's the unforeseen."
"We have a saying out here: You never know until you tow."
"That's kind of why we are all fishermen, the future is not dictated to us. We make our future."
--Kodiak trawl captains

How do managers at the front-line of natural resource extraction industries organize with "the unforeseen"? How do they make sense of indeterminate natural systems? Charged with organizing their operations with submerged, complex, and dynamic natural systems (Berkes, Colding, & Folke, 2003; Gunderson, Holling, & Light, 1995), front-line managers in the commercial fishing industry, i.e., vessel captains, do not know if the fish they *will* catch are the fish they *want* to catch until *after* they have caught them. Yet, captains in fishing industries around the world face increasing regulatory pressure to be more selective in terms of what they remove from marine systems (Kelleher, 2005; Patrick & Benaka, 2013), while also saddled with increasing economic pressure, due to surging fuel costs, to increase the efficiency of their fishing processes (Cheilari, Guillen, Damalas, & Barbas, 2013; Priour, 2009). Captains face great pressure to make sense of indeterminate systems prior to extracting from them, and to be quick about it.

The goal of this study is to elucidate the processes through which front-line managers attempt to make sense of the natural systems they *will* fish from, primarily in terms of whether they are systems they *want* to fish from, *prior* to fishing from them. The research question guiding this study is, what are the processes through which front-line managers in a commercial fishing industry organize with indeterminate natural systems? I investigate this question through an inductive study of fishing vessel captains operating out of Kodiak, Alaska, focusing on the day-to-day processes through which they determine where and when to fish, with the overarching purpose of extending our understanding of the overlap of organizing processes and front-line natural systems.

Although the natural world has long been considered a crucial part of our understanding of organizing and organizations (Bansal & Gao, 2006; Hoffman & Bansal, 2012), the interrelationships between natural processes and organizing remains underspecified (Whiteman & Cooper, 2011). There is a robust literature examining the relationship between corporate processes and structures and the natural environment (e.g., Bansal & Roth, 2000; Flammer, 2013; Russo & Fouts, 1997), and several studies of organizational processes and structures within natural resource extraction industries (Bansal, 2005; Holm, 1995; Sharma & Henriques, 2005; Weber, Heinze, & DeSoucey, 2008; Zeitsma & Lawrence, 2010), yet few studies have examined direct connections between organizational and natural processes (e.g., Weick, 1993; Whiteman & Cooper, 2011). The current literature emphasizes distal relationships, characterized by 'action at a distance,' while proximate relationships, characterized by 'action by contact' (Cooper & Law, 1995), remain under-researched. There is a vibrant body of work in the natural sciences on the proximate human dimensions of natural processes, yet within organization studies there is minimal work on the proximate natural dimensions of organizational processes. This study demonstrates that examining sensemaking at the front-line of a natural resource extraction industry offers a way to improve our understanding of the proximate natural dimensions of organizing.

Sensemaking encompasses the social processes through which actors answer the questions, 'what's going on here?,' and, 'what do I do next?' (Weick, Sutcliffe, & Obstfeld, 2005: 412). At the front-line of commercial fishing, captains, attempting to "make their future," continually make sense of where to fish next, whether its the next set, the next trip, or the next season. What is "perhaps the fundamental problem of ordering and organizing" is a salient issue in the practice of commercial fishing: "the problem about what will come next" (Cooper & Law, 1995: 242). To make sense is to create a "workable level of certainty" (Weick 1969: 40) about what is happening and what could or should happen next. Workable levels of certainty "suggest plausible acts of managing, coordinating, and distributing" (Weick et al., 2005: 411). These acts of managing, coordinating, and distributing are the organizing processes that, taken together, are the organization (Chia, 2003; Czarniawska, 2004, 2009; Law, 1994). What sensemaking delivers to its enactors is a workable determination of what *is* happening now and what *can* happen next. Ecological sensemaking expands the sensemaking literature by examining the construction or loss of a workable level of certainty in terms of how to organize with natural processes (Whiteman & Cooper, 2011). This study of sensemaking processes among commercial fishing captains clears more of the trail that was first mapped by Weick's (1993) examination of sensemaking in the front-line context of wildland firefighting, and later blazed by Whiteman and Cooper's (2011) examination of sensemaking in the front-line context of subsistence hunting.

Both Weick (1993) and Whiteman and Cooper (2011) studied sensemaking processes aimed at natural systems, which led to short-term crisis events. Short-term crises events have long served as a fruitful context for sensemaking research (Maitlis, 2005; Maitlis & Sonenshein, 2010), providing salient examples of sensemaking that have allowed scholars to extract lessons about factors that may lead to tragic events, while also broadening our understanding of sensemaking more generally (e.g., Brown, 2004; Dunbar & Garud, 2006; Gephart, 1993). The logical next step in our examination of ecological sensemaking is to expand our horizon beyond short-term cases selected for their actual or potentially extreme outcomes; the next step is to examine day-to-day ecological sensemaking processes as actors pursue basic goals, such as profitability or sustainability.

While we have begun to understand ecological sensemaking in the pursuit of basic survival, we have not yet begun to understand ecological sensemaking in the pursuit of basic progress. If we want to understand the role sensemaking plays in natural resource management, allowing us to better understand the interrelation of organizational processes and sustainability, a long-established goal among several organizational scholars (e.g., Aragon-Correa & Sharma, 2003; Kassinis & Vafeas, 2006; Shrivastava, 1995), we need to explore more typical front-line management processes involving natural systems. From current studies that involve organizing in an ecological front-line context (Weick, 1993; Whiteman & Cooper, 2011), we learn *who* can make appropriate sense in a time of crisis (ecologically-embedded actors), *where* they are more likely to make it (in familiar contexts), *what* personal and social characteristics may potentially enable them to make appropriate sense (experiential knowledge, role structures, attitude of wisdom), and *why* they need to make sense (survival). Yet, even in studies of crisis-oriented ecological sensemaking, we do not learn the rote mechanics of *how* actors make appropriate sense, outside of more rarefied processes such as improvisation and bricolage. ‘How’ questions require us to understand the processes through which events are constructed, modified, and reproduced (Langley 2007, 2010). This study uses process-based data to understand the rote mechanics through which managers construct, modify, and reproduce workable levels of certainty at the front-lines of a natural resource extraction industry during typical, day-to-day activities.

To investigate the rote mechanics of ecological sensemaking, this study focuses on sensemaking at sea. The 'at-sea' context places demands on sensemaking that are different from existing sensemaking contexts. Existing models of sensemaking concern cues that are weak (Rerup, 2009), ambiguous (Corley & Gioia, 2004; Vaara, 2003), equivocal (Weick, 1979, 1995), shocking (Bean & Eisenberg, 2006), and discrepant (Jett & George, 2003), resulting in problems of categorization (Dunbar & Garud, 2009), classification (Stigliani & Ravasi, 2013), and labeling (Gioia & Thomas, 1996). The sensemaking problem that emerges in these contexts concerns either a mismatch between bracketed cues and mental models in the case of ambiguity, equivocality, discrepancy, and shock, or a failure to connect bracketed cues with an appropriate mental model in the case of weak cues. What is missing, however, is sensemaking characterized by cues that are missing, invisible, or unknowable (Weick, 2006, 2010) due to contexts constituted by processes that are submerged, hidden, or of an unknowable character. The sensemaking problem that emerges in these contexts concerns filling in gaps in sense rather than correcting mismatches or inappropriate sense. Making sense in the face of missing, invisible, or unknowable cues has been theorized as relying on processes of abduction (Weick, 2006, 2010, 2012) to produce conjectures and hypotheses to fill in the gaps. Weick (2006: 1730) asks the questions, "What is the role of guesses in organizing? Is distributed abduction a model for organizing in the face of unknowability?" This study uses data from interviews and observations to understand the day-to-day processes through which captains make sense of front-line indeterminate natural processes in order to determine what the story is, and what comes next in the interest of determining where to fish, and where to fish next. I elucidate those sensemaking processes, and in doing so construct a process model of day-to-day ecological sensemaking at the front line of natural resource extraction contexts, from which I offer an answer to Weick's questions.

CONTEXT: THE KODIAK TRAWL FLEET

In addition to the rich context that the front-line of resource extraction industries offer organizational theorists interested in understanding the natural dimensions of organizing, natural resource extraction industries deserve attention because of the important role they play in worldwide economies. For example, US private businesses engaged in natural resource extraction employed nearly 800 thousand people in 2011, with an annual payroll of over 70 billion (BLS, 2013). Commercial fisheries in Alaska employed more than 30 thousand people a year from 2001 − 2011, and in 2011 the industry accounted for 1.9 billion of the 5.3 billion pounds of fish landed in the US (Whitney, 2012). Kodiak Island, the second largest island in the US, is typically ranked the 4th, 5th, or 6th largest port in the US in terms of pounds landed annually, while it usually ranks between 3rd and 6th in term of the annual monetary value of what is landed. In 2011, 350 million pounds of fish was delivered to Kodiak docks, worth $178 million. Of these fish landed, the trawl fleet landed at least 176 million pounds of pollock, rockfish, and flatfish, and large share of the 85 million pounds of Pacific cod that was delivered (Kodiak Chamber of Commerce, 2012).

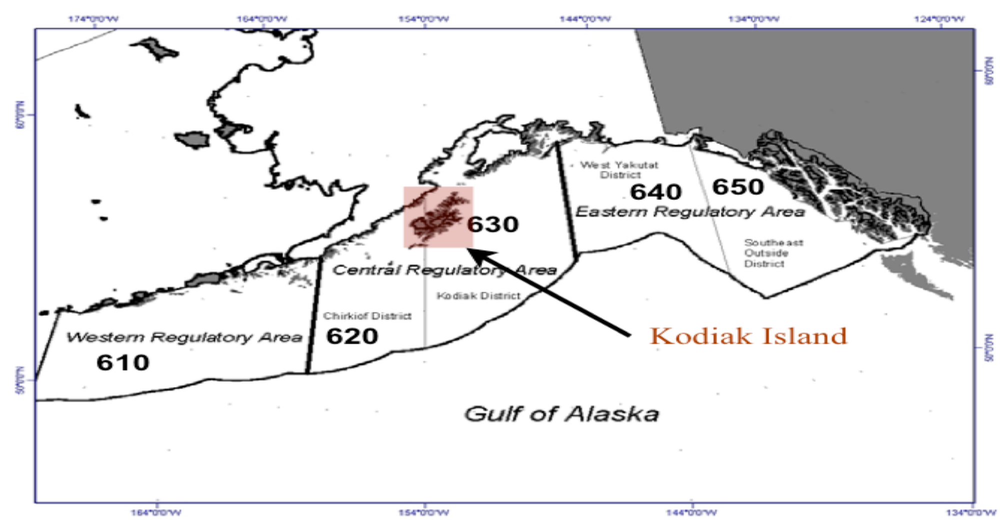

Figure 1: Regulatory fishing areas in the Gulf of Alaska (NPFMC, 2011:

The Kodiak trawl fleet consists of the same type of fishing vessels using the same type of gear to catch the same species in the same fisheries in the same general area, under the same regulatory management structures, which they deliver to the same group of Kodiak-based processing plants. In terms of vessel type, the Kodiak fleet is constituted solely by catcher-vessels (CVs), which are vessels that deliver their catch to a shoreside fish processing plant. The alternative to the CV is the CP (catcher-processors), which houses own processing plants on board. The Kodiak fleet consists of a stable core of CVs that only fish in the Central Regulatory Area of the Gulf of Alaska (see Figure 1), as well as a group of transient vessels that hop from the Gulf of Alaska to fisheries in the Bering Sea to fisheries off the coasts of Washington and Oregon. The size of the fleet fluctuates with whatever fishery is in season, primarily depending in how lucrative it might be, but it is typically around 35 vessels. About 25 vessels homeport in Kodiak, while about 10 homeport in Washington or Oregon. Approximately 15 vessels are

Figure 2: Examples of Kodiak trawl vessels (photos courtesy of Alaska Whitefish Trawlers Association)

owner-operated, meaning the captain also runs the vessel part of the year, while several owners own multiple boats. In addition, corporations that own fish processing plants also own a few boats in the Kodiak fleet (many captains complain that this number increases every year). Vessels in the Kodiak fleet range in length from around 58ft to around 125ft, with an average length of around 80ft feet. While vessels vary in how much fish they can carry in their fish holds, about half of the fleet meets or exceeds their regulatory ‘trip limit’ of 300,000 pounds, while the other half holds anywhere from 150,000 to 280,000. The trip limit means that even though a vessel may hold more than 300,000 pounds of fish, it can only bring that amount to Kodiak. The fleet as a whole can hold, according to trip limits, about 3,800 tons of fish at a time. See Figure 2 for three examples of Kodiak trawl vessels.

Each Kodiak vessel has the same general organizational structure, constituted by a captain, first mate, engineer, and one or two deckhands. The first mate usually works on deck with the deckhands, helping and managing their frenetic yet interdependent activity as they conduct the hundreds of interlinked small maneuvers, adjustments, fittings, and connections required to both set a trawl net into the water, haul it back on board, and then dump its contents (see Figure 3). The engineer is responsible for all vessel mechanics, from maintaining the one or two diesel engines employing anywhere from 500 to 1200 horsepower (most of the fleet operating at around 900 horsepower, which is twice the average horsepower of a semi truck), to operating the screaming hydraulics as they strain to pull a net full of fish on board, to fixing the all-to-often malfunctioning head. The captain oversees the first mate, deckhands and the engineer, while also determining where to fish, and, once he finds a place to fish, how to catch them. The captain is also responsible for everyone's safety and overall compliance with the numerous regulations a vessel has to follow while at sea, such as which fish can be sorted from the catch once it is dumped on the deck, what type of trash can be tossed at sea, which areas the vessel can fish in - or even 'transit' in. Several captains, while interviewing them in their wheelhouse, waved a thick book of regulations issued by the National

Figure 3: Deckhands dumping a codend of cod (photo courtesy of Alaska Whitefish Trawlers Association)

Marine Fishery Service (NMFS), which is the Federal agency charged with regulatory and scientific management of Federal fisheries (the fisheries occurring outside state waters), emphasizing the complex magnitude of regulations they have to abide by at sea. The local NMFS manager charged with enforcing those regulations did the same in his office. Vessels usually have two captains who alternate running the boat throughout the year, and most crew alternate as well. The overarching business model for a trawler is to always be fishing.

In addition to being defined by type of vessel, the fleet is also defined by their fishing gear. The Kodiak trawl fleet employs trawl gear, which works by using a large net to overtake slower moving fish rather than drawing fish to it through an attractant such as bait, as several other gear types do (e.g., hook and line, traps, pots). Thus, the process of trawling involves pulling a large net (see Figure 4), the largest of which approaches a mile around, typically with an opening of around 80 ft by 240 ft opening, mesh as big as 120 feet at the front, ‘large enough to drive a car through’ (personal interview, captain) tapering to about five inches at the back of the net, which is called the ’codend.’ The codend is where caught fish collect as the captain continues to tow the net. Codends are typically 120 feet around and anywhere from 60 feet to over 1200 feet long, varying with the type of fish being targeted. The larger codends in the Kodiak fleet hold as much as 100 tons of catch (see Figure 5). Towing a trawl net in Alaskan waters means pulling the net across or near the bottom, often pregnant with tons of fish, in winds that often hit more than 40 knots, while wrestling enormous waves and dealing with obstreperous currents.

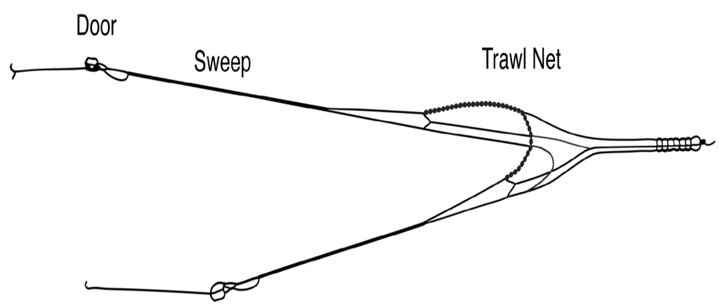

Figure 4: Trawl net diagram (Rose et al., 2010: 1)

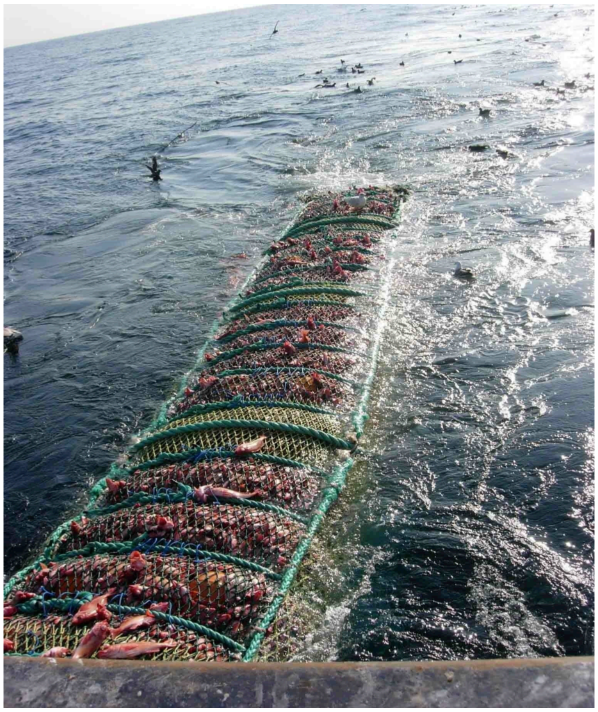

Figure 5: Codend full of rockfish (photo courtesy of Alaska Whitefish Trawlers Association)

To fish with a trawl net is to conduct a tow, which is the basic event of every trawling operation. The tow starts with setting the net, and ends when the net is hauled up and the fish are dumped either straight into the fish hold or onto the trawl deck for sorting. Individual tows are embedded in a fishing trip, which is the period from when a vessel leaves the dock, heads out to the fishing grounds, fishes either until its fish holds are full or the fishing season ends, and returns to the dock to unload its catch. Individual trips combine to make a fishing season, which is either the amount of time it takes a fleet to catch a quota. The length of a fishing season is a factor of the size of the quota, the extent of fleet fish hold capacity aimed at catching it, and the nature of natural systems in which the fleet is fishing - primarily the extent to which target fish are schooled up. If natural conditions are ripe in that fish are schooled up, then fishing will likely be 'fast,' and the season will be short – from a day to perhaps a week. Individual seasons add up to a year, and with the beginning of each new year comes the release of new quotas for a new set of seasons, from which spring new fishing trips. While tows add up to a trip, trips add up to a season, and seasons add up to a year, the information garnered from tows informs subsequent tows in the same trip, subsequent tows in subsequent trips, and subsequent tows in subsequent trips in subsequent seasons. Running a fishing operation is a continual epistemological process overlaid upon clearly demarcated ontological events. This is the reason that a determination of where to fish is always a determination of where to fish next. The only difference is the proximate or distal relationship of the previous tow.

In terms of fishing for the same species, the Kodiak fleet targets pollock, cod, several species of flatfish, and several species of rockfish. A 'target species' is created when regulators assign a quota to a species, allowing fishing to occur for that species, while also defining the amount that can occur based on a combination of scientific recommendation and regulator opinion. Each target species quota is created annually, after which it is broken up into seasons within that year. A season is created when regulatorily-defined start and end dates are attached to a target species quota. For example, there are four trawl catcher-vessel pollock seasons (i.e., A, B, C, D) in each area of the Central Gulf (620 & 630) (see Figure 1), each having its own regulatory start and end date, each of which is assigned a percentage of the annual quota (based on an estimated distribution of the GOA pollock biomass during that season). Thus, there are eight pollock seasons in the Central Gulf alone, yet when other targets such as P. cod, various rockfishes, and flatfishes are factored in, there at least 17 target fisheries, many of which are overlapping, the Kodiak fleet can engage in each year within the Central Gulf. The Kodiak fleet is somewhat unique in Alaska in that each vessel has a multi-species fishing plan for moving efficiently and profitably from one fishery to another within the Central Gulf, with some planning to enter fisheries outside of the Central Gulf in the Western Gulf, Eastern Gulf, as well as the Bering Sea and off the coasts of Washington, Oregon, and California. Nonetheless, there are certain target fisheries that members of Kodiak fleet tend to always fish in - pollock, cod, and rockfish - season after season, year after year.

Taken together, the Kodiak fleet is composed of the same types of vessels fishing in the same general area for the same multiple target species within the same seasons, and under the same management structures. Yet, in each of these points of similarity there is variation, such as the size of the vessel and individual fishing plans. Each vessel is a business, and each works to make a profit on a tow, trip, season, and yearly basis. This study is concerned with the tow and trip-level processes through which captains make sense of their interrelationships with target species, non-target species, management structures, and other factors with the goal of making the venture worth its while - in other words, profitable.

METHODS

The purpose of this study is extension of theory on sensemaking into natural resource extraction industries, as well as further specification of the concept of ecological sensemaking. Theory extension is appropriate when existing ideas can provide the foundation for exploration of new theoretical territory (Lee, Mitchell, & Sablynski, 1999). I used qualitative methods to collect data due to their sensitivity to individuals' interpretations, activities, and interrelated interpretations and activity sequences, as well as contextual elements and processes (Langley, 1999, 2007; Lofland, Snow, Anderson, & Lofland, 2006). Consistent with a process orientation, my research design was a longitudinal interpretive case study (Eisenhardt, 1989; Yin, 2008).

I chose to study the commercial fishing context because of my background in the Alaskan fishing industry. I spent three years and two summers working as a fisheries observer for the National Marine Fisheries Service on fishing vessels, primarily trawlers in the Bering Sea and off the coasts of Washington and Oregon. Being a federal fisheries observer meant that while I lived on board with the crew, I was an outsider, a 'fish cop' as fishermen wont to characterize. My duty was to sample the catch according to statistical protocols and monitor fishing operations for regulatory violations. Fisheries observer data is the primary information upon which regulatory management decisions are made in Alaskan federal fisheries. In total I logged 669 days at sea, working on 17 different vessels, 15 of which were trawlers. This background gave me an in-depth understanding of at-sea fishing operations while also giving me the legitimacy I needed, primarily as someone who has extensive experience at sea, to gain access to the Kodiak trawl fleet for ethnographic research.

I chose to study the Kodiak trawl fleet for practical and topical reasons. In terms of practical reasons, the fleet has a reputation for being a local, community-based fleet, while also being a large industrial fleet. I knew that many trawl captains who fished out of Kodiak also lived there. From preliminary research, I also realized that there were local industry and regulatory managers, industry personnel, and community groups I could also study while the fleet was fishing. Being in the community was being at the front-line of commercial fisheries management. In terms of topical reasons, my initial interest was in fleet self-regulatory processes when engaging in a 'privatized' or 'rationalized' catch-share fishery. The GOA rockfish fishery had just been converted to a catch-share fishery in 2006, and my goal was to study the Kodiak fleet as they moved from competitive fisheries, such as pollock and cod, to the non-competitive rockfish fishery. Yet when I arrived in the field in 2011, I found that the issue that was of salient concern to the Kodiak fleet and the broader community was bycatch - Chinook bycatch. This concern transitioned to halibut bycatch in 2012. Thus, a few months into my fieldwork, I realized that I was no longer studying the fleet as they managed their operations in and out of a catch share fishery, but as they managed their bycatch in all fisheries. Because of the ethnographic nature of my research methods, my case shifted with shifting focal issues on the ground, whether I wanted it to or not.

Data Collection

My primary fieldwork spanned a two-year period (2011 − 2012). I spent January through May of each year in Kodiak, observing the fleet as they enacted the same winter fisheries each year. In both years the fleet started fishing Pacific cod, transitioned to various pollock fisheries, in 2012 the fleet transitioned back to cod after pollock and then back to pollock, in both years flatfish came after pollock and cod, and in both years the rockfish fishery followed flatfish. My data sources include observation, participant observation, and semi-structured interviews. I focused these methods not only on the trawl fleet, but also on the broader Kodiak fishing community, for I felt I could not understand what it means to be a Kodiak trawler unless I had an idea of what it means to not be a trawler.

In terms of observation and participant observation, I observed 15 trawl industry meetings, each lasting one to three hours. These meetings were organized to address both regulatory and industry management issues. Most meetings coincided with the start of a fishery, in which the fleet wanted to impose their own rules on how they would enact the fishery. Fleet meetings were attended by captains, processing plant managers, consultants, NMFS mangers, vessel owners, among others. Attendance varied with the purpose of the meeting, and ranged from as low as five to as high as approximately 35 people. I also observed three meetings of the North Pacific Fishery Management Council (NPFMC), which is the federal body charged with constructing fisheries regulations for the federal fisheries in Alaska, which NMFS implements. Each NPFMC meeting spanned approximately five days. In addition, I observed two meetings of the Kodiak Fisheries Advisory Council (KFAC), which is an advisory group to the local Kodiak government, each of which lasted about two hours. And finally, I observed one meeting of the State of Alaska Board of Fish (BOF), which is a government body charged with creating regulations for state water fisheries. This meeting lasted about three days. I spent one day of observation on board two vessels, each conducting non-fishing, industry-based research trips to test devices designed to exclude salmon from the catch. And I observed fishing activities during a fishing trip targeting flatfish on one vessel and a rockfish fishing trip targeting rockfish on another vessel. These two trips together lasted seven days. Thus, in total I observed operations on four fishing vessels.

The last type of observation I conducted was seven months of participant observation in the local industry consultant organization that helps manage the trawl fleet. The 'participant' part of this method consisted primarily of editing documents and working with catch data. This organization serves as sort of a 'middle-range' organization between the front-line fleet and the 'back-line' management and regulatory bodies, helping one to organize in terms of the other. I observed daily activities in this organization for two months in 2011, three months in 2012. It was this method that helped me gain access to the previously mentioned observational opportunities. I took hand-written notes during meetings and fishing trips, while also obtaining official recordings of NPFMC, KFAC, and the BOF meetings. I transcribed notes from fleet meetings and fishing trips as soon as possible so that they were as accurate as I could manage. In terms of the local consultancy organization, I took hand-written notes when possible. Later in the second year of my fieldwork I was allowed to record the time I spent in this organization.

I conducted 54 semi-structured interviews of participants involved both in the trawl fleet and the broader Kodiak fishing community. All interviews focused on core topics of bycatch and front-line fisheries management. When interviewing individuals outside of the trawl fleet, I focused on their perceptions of the trawl fleet itself, as well as how they perceived that the activities of the trawl fleet impacted their own fishing activities. When interviewing captains outside of the trawl fleet, I also focused on their own fishing processes. Interviewees outside of the trawl fleet included processing plant managers (4), salmon and halibut captains (7), industry advocates/consultants (11), and National Marine Service managers (6). When interviewing

Kodiak trawl captains (26), I focused on how they managed their fishing operations, including how regulations, bycatch, weather, ecology, other captains, and political issues impacted their fishing practice (see Table 1 for example questions). Captains had an average of 26 years of experience at the helm of a fishing vessel, ranging from 16 to 41 years. I asked each captain the same set of questions, such as “How do you deal with Chinook bycatch?” and “What makes another captain good to work with?”, while also letting interviews emergently wander to different topics of concern. I recorded interviews with an electronic recorder when given permission, otherwise I took hand-written notes. Recorded interviews were transcribed verbatim, and hand-written notes were typed up as soon as possible in order to merge notes and memory into as accurate transcription as I could manage. Interviews typically lasted between one and two hours, with the longest over four hours and the shortest about half an hour.

Table 1: Example interview questions	
Fishing captains and owners who used to be captains	How long have you been fishing? How long have you been a captain?
	Is there anything that surprises you at sea?
	Please describe a normal day of fishing
	What makes a good captain? What characteristics separate one captain from another?
	What is your approach to dealing with bycatch?
	Who do you communicate with at sea? Why do you communicate with that person? What makes another captain good to work with?
	Does communication changed at sea in different management systems?
	What would you change about the current management system?
	What is self-management to you? What makes it possible? What hinders it?

Data Analysis

All data were analyzed using Nvivo. I began the analytical process with interviews of captains. From this initial step, dominant themes began to emerge, such as “interrelating with ecological processes,” “working with processing plants,” and “updating to avoid Chinook.” With initial dominant themes in mind, I moved to fishing trip data, during which I added and refined themes. From there I moved to other interviewees, to fleet meetings, and then to NPFMC meetings. I worked through my data and revised my themes iteratively (Glaser & Strauss, 1967). On multiple occasions I took a break from Nvivo to organize themes into a coherent theoretical framework. After multiple iterations of coding data and organizing frameworks, I finally settled on one that, as perhaps put best by Pratt (2000), "I believed offered a strong contribution to theory without doing undue violence to my experience" (462). And, like Pratt, I have also discussed my framework with key participants, altering it according to their suggestions.

FINDINGS[1]

The research question driving this study is, how do front-line managers the commercial fishing industry make sense of their relationship with natural systems? In this section I answer this question by first examining the elements of the process through which Kodiak trawl captains organize with front-line natural systems, and then I follow one captain's sensemaking process as he determines where to fish, and where to fish next. Thus, first I examine the static constituents of the process of sensemaking at sea, then I examine how these parts articulate as the process plays out. The product of this analysis is a model of individual-level sensemaking that captains engage in while organizing with natural systems, from which front-lines within the commercial fishing industry emerge. The following questions structure this analysis: 1. *Why* do captains organize with certain front-line natural systems? 2. *What* front-line natural systems do captains organize with? 3. *How* do captains make sense of which specific natural systems to organize with? Thus, the analysis below is structured using different adverbial tools (i.e., why, what, and how) that elucidate the distinctive, yet interdependent, parts of the sensemaking at-sea process. Following this adverbial structure is an illustration of one captain's sensemaking venture as he

[1] All informants in this chapter are Kodiak trawl captains, unless otherwise noted in the text. Data derived fishing trips and other observations are indicated in the text; all other data are taken from personal interviews conducted by the author, and are not indicated in the text.

attempts to create a profitable interrelationship with natural systems, i.e., a front-line with a particular organizational character.

1. WHY: PROFITABILITY

At the heart of a successful fishing process is the ability of the captain, crew, and owner to, as several interviewees put it, “make a living from it.” Whether a fishing vessel is a small, owner-operated operation or part of a corporate conglomeration of vessels and processing plants, captains have a common duty of enacting profitable fishing processes because, as is the case with most businesses, profitability is the overarching goal of commercial fishing. Profitability is defined here as the income from selling the resources extracted from natural systems minus the overhead costs of extracting those resources. One captain describes common overhead costs embedded in trawl fishing in the following: “It’s not cheap to take these things out fishing, it's not cheap. It’s probably close to three thousand dollars a day just for fuel, plus observer costs and groceries and everything else.” Within the profit derived from commercial trawl fishing in the GOA are individual incomes of the captain and crew. Because individual incomes are typically derived from a share of the profit, how much the captain and crew make from a fishing trip depends on how profitable the trip was. Therefore, the lower the costs of catching fish, and the more the caught fish are worth, the more the captain and crew will make.

A profitable future imposes a demand on the present for an efficient means of bringing itself to life. At sea the onus falls upon captains to fashion an efficient pathway out of the past, through the present, and into the future. Captains often noted that the challenge of moving the margin of income above the margin of costs is one of the aspects of being a captain that they value most, as the following exemplifies:

> That's kind of why we are all fishermen - because the future is not dictated to us. We make our future. Whether we are successful with this or not, at least I leave

> town and my future is dictated by me, not by AT&T or Apple or who owns that company. Your talent dictates how successful you are, not some CEO of some corporation.

Captains know, at a general level, what each fishing trip will cost based on predictable overhead costs. As one captain put it, "Between the cost of the fuel and the cost of the [NMFS fisheries] observer, you have some pretty heavy fixed costs on a daily basis." The challenge captains face to find a place to fish that offers the possibility of catching enough fish, and doing so in a sufficiently efficient manner, to pay the costs of the trip and have as much profit left over as they can muster. To accomplish this feat, captains must wrest determinacy from indeterminate front-line systems, so that they may know, to a workable degree, before they make certain tow. Knowing before they tow is a primary component of the talent it take to be a successful commercial fishing captain.

Table 2 below elaborates two dimensions of the efficiency imperative that captains face at sea: space and time. Fuel costs are used to elaborate spatial demands for efficiency, for every movement of the vessel at sea, whether for the purpose of trawling or merely steaming, requires an expenditure of fuel. The sources of temporal pressure for efficiency are many, from the influence of competing with other captains for a shared quota in a "race" fishery, to the time restrictions fish processing plants put on how long fish can sit in below deck in a hold before they will start to lower the amount they will pay for them, to simply a more generalized sense of always having to hurry. Fuel also imposes impose temporal pressure, for the longer a vessel takes to steam or fish, the higher the fuel costs. Time is money at sea because, whether fishing or steaming, passing time is accompanied by burning fuel, as well as other accumulating overhead costs. It is these factors, among others, that constitute the imperative for efficiency that captains face when organizing their vessel with natural systems at the front-line of commercial fishing.

Table 2: Dimensions of the efficiency imperative captains face at sea	**Representative Quotes**
General relationship between fuel costs and towing a trawl net	"These are high volume, low margin fisheries. Unlike the crab fishery, we have high operating costs, the trawlers have the highest overhead. With towing you burn a lot of fuel. The other guys just drop their pots and pick them up. We have to tow a big net."
Spatial influence of fuel costs: fishing as close to town as possible	"We run to the closest spot and we fill the boat in three or four hours." "We pretty much go to the closest area that's open." "[Area] 630 is vast (see Figure 1), it goes all the way from Seward to the south end of [Kodiak] and the whole fleet catches their two pollock trips in about 15 minutes ten miles from town." (three personal interviews)
Spatial relationship between fuel costs and searching for fish	"Especially with rockfish, sometimes you just need to drive around and look for a long time. You try to figure out where they are and how congregated they are. But that is difficult with the costs of fuel and other fixed costs."
Relationship between fuel costs and determining whether to fish at all	"That's why I'm not fishing right now is the [fish processing plant] wasn't going to pay enough money for the fish. . . They wanted me to go rock sole fishing, and I said, 'I can't do it.' The money isn't there because you are only getting 26 cents [per pound] for those big rock sole . . . I mean, on an average trip this boat here will burn almost two thousand gallons of fuel, at $3.80 a gallon. So you are looking at seven thousand dollars off the top on just fuel costs."
Relationship between fuel costs and temporal pressure	"It would be nice if we could stop and sleep, but the clock is running. . . .with the cost of fuel for you to come out here, you got to bring some fish back." (fishing trip observation)
Combined spatio-temporal aspect of fuel costs and deciding when to fish	"Fuel is cheap in the winter when the weather is bad, and fuel gets more expensive in the summer when weather is good. So guys are going try and fish when the fuel is cheap, no matter what."
Biological and economic source of temporal pressure: deteriorating fish quality	*Interviewer:* "Is there a certain time you have to be back at the plant by?" *Captain:* "Well, once that fish [in the fish hold] gets about three days old, that's about it. . . That's what the problem is; we've been out here for four or five days so we are not gonna stop to get a good night's sleep." (fishing trip observation)
Temporal pressure induced by competition for a shared quota	"Thirty minutes could make or break a trip during this race for fish. . . I don't want to get lapped at the dock, I don't want to miss out on my last trip of the season over 30 minutes. . . This is a short little season, and this is our make or break time of the year - March is everything." (personal observation, fleet meeting)
Generalized sense of temporal pressure	"I don't know if it ever goes away, maybe the next generation of fishermen that's gonna grow up with catch shares will not have it, but you always have this sense of, we got to hurry up, got to fill the boat, got to get turned around, we got to get back there, we got to fill it up."

2. WHAT: NATURAL FRONT-LINE SYSTEMS

To determine where to fish, captains make sense of their ability to efficiently organize with processes emerging from three interlinked natural systems - ecological processes in the form of aggregating behaviors of target species, the ocean bottom and its many manifestations (e.g., mud, rock, mountain, slope), and weather. This section examines the role that processes from each system (organized below as, a. Ecological systems; b. The ocean bottom; c. Weather) play in the captains' front-line organizing processes, an element of which is addressing whether each system is primarily a source of indeterminacy or determinacy. The data show that captains are habitually disposed to organize not so much with these systems individually, but instead with recurring nexuses of relationships among these systems.

a. Ecological systems

When finding a place to fish, captains attempt to align their operating processes with their target species' ecological processes. First, captains attempt to find a particular place and time in which their target species is congregating, aggregating, or schooling. Each trawl target species typically aggregates in certain places at certain times of year, whether they do so to feed or for spawning.[2] Yet, different target species aggregate differently. For example, certain rockfish form 'little schools' in which fishing them is "like target practice," while certain flatfish tend to not so much school as gather on particular bottom types. In addition, schools of the same target species aggregate differently depending on factors such as location and time of year. For example, in certain spots pollock tend to gather with multiple other species in large mid-water "feed bands," while in other spots pollock pack tightly to the bottom, forming what captains call "carpet." Regardless of these differences, captains routinely attempt to fish a target species when individual fish are interrelated in space and time.

The fleet-wide disposition to fish the aggregations is driven by the interrelated dependency of trawl mechanics on aggregating behavior and the efficiencies that aggregating fish offer a trawl process. In terms of the dependency of trawl mechanics on aggregated fish, trawl gear

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[2] For example, fisheries ecologists who study pollock populations in the Kodiak area state, "Peak spawning at the two major spawning areas in the Gulf of Alaska occurs at different times. In the Shumagin Island area, peak spawning apparently occurs between February 15 - March 1, while in Shelikof Strait peak spawning occurs later, typically between March 15 and April 1" (Dorn et al., 2012: 57). We can safely assume that if fisheries ecologists know generally when and where fish spawn, fishing captains also know.

works by actively overtaking fish rather than passively drawing fish to it through an attractant, such as bait on a hook or in a pot. Therefore, for a trawl net to be effective it has to be towed through an appreciable biomass of fish, a necessity a captain explained in detail when heading out to the fishing grounds:

> This area is huge, thousands of square miles of fishable ground. There's flathead, rex, dover, all the species of sole live in this area. All the species of midwater pelagic fish of Alaska live in this area too. But the problem with this area is it's vast, and we're only covering 500 feet of it, and the net is only actually covering 56 feet of it. Theoretically we are herding fish toward the net with our sweeps (see Figure 4 in Background section), but how absolutely effective that is, we don't know. So the fish have to be aggregated to some degree to catch very much.

Trawl gear requires its target to be together to a certain degree, otherwise gear that more passively draws fish to it would be a more productive approach.

Within a trawl net's effectiveness is its main appeal - the temporal efficiency it brings to a fishing process, from which emerges economic efficiency. Thus, the primary benefit of trawl gear is that it offers a relatively high rate of catch, which is dependent on its interpenetration with fish that are aggregated to a significant degree. A captain explains the relationship between aggregated fish and efficiency in the following:

> When the fish are congregated together, when they are schooled up and are more interested in spawning or feeding or whatever, it's the easiest for us to catch them. When there's a million pounds between here and the jetty (pointing to a chart), it's easy for us to catch them, but when they are dispersed in the water column, it's difficult for us to catch them.

A general rule is the more aggregated target fish are, the quicker the vessel can fill its fish hold, an efficiency that can reverberate throughout the fishing process. For instance, the quicker a vessel can fill its fish hold, the quicker the vessel can finish a trip. The quicker a vessel can finish a trip, the less its captain and crew will spend on overhead costs, such as fuel. Captains and crew operate on potential, and catch efficiency tend to increase their potential to "make a living from it."

How this system influences front-line organizing A primary source of indeterminacy involved in fishing from aggregated fish is the particularity of where and when a certain target species will aggregate. While most target species tend to aggregate at the same general times and in the same general places, the specific times and places in which aggregations show up is a source of indeterminacy nestled within more general determinacy. As one captain commented, "Basically, we know when the fish are going to show up, it's a matter of finding them." To "show up" means that individual fish are aggregated to an extent that they can be effectively caught with a trawl net. The effectiveness of fishing with a trawl net, and the efficiency of trawling in general, is reliant on targeting a species that aggregates predictably at a general level, and then finding particular aggregations. One of the primary duties trawl captains are charged with is moving from the abstract predictability of general places and times in which aggregations might be found to the concrete particularity of specific places and times in which aggregations will be found. It is demonstrated below that this movement is accomplished through sensemaking.

b. The ocean bottom

While the nature of trawling requires that captains attempt to fish from aggregations of target species, doing so requires captains to also organize with geophysical processes, manifested as the ocean bottom, that these aggregations tend to be found on or near. There are three interrelated characteristics of the ocean bottom that impact where a trawl captain will choose to fish. First, the Kodiak fleet fishes 'groundfish,' which means, just as it sounds, that most of their target species live on or close to the ocean bottom. This in turn means that, when targeting an aggregation with a trawl net, captains must drag their net across the ocean bottom. For instance, when fishing cod the net must, depending on the area, "hug the bottom;" whereas when fishing for certain rockfish species captains try to fish "a little lighter on the hard bottom" (fishing trip observations) in order to prevent too much damage to the trawl net.

The second characteristic that impacts where a trawl captain will choose to fish is the tendency of certain species to associate with certain types of ocean bottom. For example, two species of rockfish are typically found around rocky bottom, while another is found in the deeper water, ‘off the edge’ or ‘up and down the bank.’ Some flatfish are found on sandy bottom, others are found ‘on the edge’ between sandy and rocky bottom, while pollock is found off the bottom in some places and tightly packed on the bottom in other places. The third characteristic of the ocean bottom that influences where a captain chooses to fish is the ability for certain bottom types to damage a trawl net. The effect is that certain bottom types constrain where captains can trawl, as one captain describes in the following: “A trawl can only fish in specific areas, and they are very limited areas. They can't fish in rocky bottom, they can't fish on too muddy of a bottom.” During my fieldwork, a salient concern captains had on fishing trips was ‘hanging up’ on rocky bottom, which often meant tearing a net (which are typically made of nylon). A torn net can reduce efficiency by detracting from fishing time, for crews usually repair torn nets at sea.

How this system influences front-line organizing While the specific location of an aggregation is a source of indeterminacy when deciding where to fish, the bottom can be a source of determinacy. This determinacy is derived from a combination of the relatively slow rate in which the ocean bottom changes, which means that the nature of the ocean bottom that captains encounter in particular places does not, from their perspective, change from year to year, and the fact that wheelhouse electronics and nautical charts provide captains with *a priori* knowledge regarding the spatial characteristics (e.g., shapes, relative distances) and depths of the bottom they can expect to find in any given area. When captains pair these concrete characteristics of experience with past experiences, they are equipped to formulate a conjecture regarding how a stretch of bottom and a trawl net might interrelate - before actually fishing there. The following demonstrates a captain producing such a conjecture:

> A trawler is not gonna be able to fish where it goes from 50 fathoms to 13 fathoms, so a trawler is not gonna be able to fish here at all (pointing to the chart). He will be able to fish right here, he will be able to fish maybe right here (pointing to different spots on the chart). If you try to come out of 50 fathoms and go up over this hard spot, you wont be able to tow there because your net will hang up on the hard bottom. This is hard, rocky bottom right here. . . 99.9% of the time you couldn't tow out of 50 fathoms over 13 fathoms and back down and not hang up, tear your gear, or lose it altogether. . . Usually the reason this bay is here is probably a glacier came down and pushed this down into here, and the moraine that created this fjord will all be piled up here, rocks the size of this building maybe.

By merging abstractions from past experience in the form of knowledge of geological processes and distillations of past trawling events with cues from more concrete circumstances in the form of the topographical details given in the chart, this captain was able to hypothesize about a trawler's ability to tow on particular stretches of bottom. This hypothesis is the product of sensemaking about a potential future event - it is sense the captain has made of a potential place to fish. The relatively unchanging determinacy of the ocean bottom, paired with both the generalized predictability of target species aggregating behavior over time and the propensity for certain target species to associate with certain bottom types, results in a recurring coincidence of certain bottom types and aggregations of certain target species. Figure 6 below captures this relationship between these three factors. The seed of predictability from which captains make sense of where to fish is born of the recurring nature of these relationships.

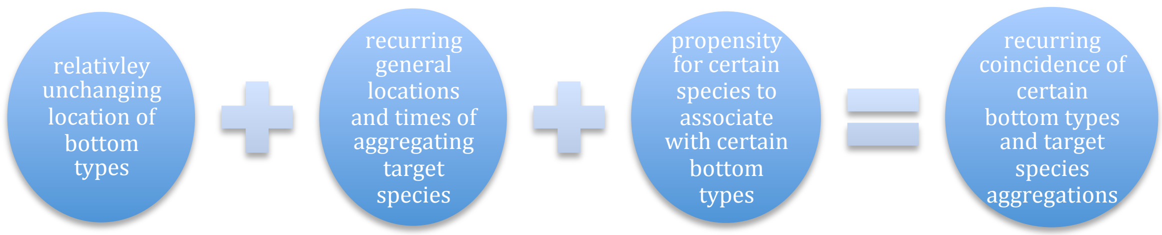

Figure 6: Relationship among two front-line systems: Bottom types and target species aggregating behavior

c. Weather processes

Like the ocean bottom, weather can constrain where a captain can fish, and captains must manage their relationship with weather as well. While in the field, the rockfish trip I observed was delayed a day due to bad weather and the route the captain took to the fishing grounds was influenced by bad weather. In addition, one captain I interviewed had just returned from a fishing trip in which his vessel turned 90 degrees on its side, nearly capsizing due to bad weather. The start to several fisheries was also delayed due to bad weather. When captains talk about where or when they will fish, their discussion usually contains a weather qualification, such as the one stated nearly in unison by four captains when, during a fleet meeting, the fleet was asked when they were going to start fishing: “It all depends on the weather.” A more detailed example of the weather’s influence on a potential fishing process was given by a captain when asked if he planned to fish for rockfish on his next trip:

> If the weather is good. We don't want to deal with rockfish in tough weather, we don't want to be hung to the bottom in rough weather. It will be entirely dependent on the weather - if the weather is good we will be rockfishing, if the weather is lousy, we will be tied up in town. (fishing trip observation)

As this quote suggests, one of the reasons the weather plays such an influential role is that it impacts whether or not captains can organize with interrelated aggregation and bottom, often acting as a gateway to fishing in certain spots where such interrelating might be. Thus, weather and a time and place are interrelated in terms of fishing there, even though weather, bottom, and aggregating behavior may not be interdependent.

How this system influences organizing Unlike the determinacy of the ocean bottom, captains must manage the indeterminacy weather imposes into a determination of where to fish. While abstract annual weather patterns lend themselves to predictability, the particular weather in a particular fishing spot lends itself to unpredictability. The manner in which weather does this is twofold, the first being the temporal unpredictability of weather, the second is its spatial unpredictability. Unlike the bottom that changes on a geological time scale, and aggregations that change on an annual time scale, the weather changes on a daily or even hourly scale, as one captain observed in the following:

> I've only been here for 27 years but I don't think any of us could call the weather on the 15th or 16th which is four days from now; I can't call the weather frickin' 24 hours ahead. (fleet meeting observation)

In terms of spatial indeterminacy, finding a place to fish often involves potentially not knowing the specific nature of the weather on certain fishing grounds. If a captain is first to the grounds or is lacking information from captains who are already there, he cannot be sure of the weather on those grounds until he is actually there. In the following, a captain describes having to abandon a fishing trip because he did not realize how bad the weather on the grounds was until he got there:

> I've gone over [to the grounds] the day before the fishery closure and I've steamed back home empty because of the weather. I made a decision, safety over dollars. And that's the decision and its a tough one to do. I turned around five times, steamed, steamed back, shitty; steamed, steamed back, shitty. Five times I did it, and I finally said, 'fuck it I'm going home, safety first,' and forfeited a load.

This captain could steam about in the inclement weather, but he decided he could not fish from an aggregation due to the weather. The relationship between the weather and other front-line processes, whether the relationship is one of preventing captains from leaving the dock to go out to fish, or preventing captains from fishing once they get to the grounds, is yet another front-line relationship that captains attempt to organize their fishing processes with.

The upshot of the natural processes and relationships considered thus far - the spatio-temporal recurrence of aggregations of target species, the spatio-temporal continuity of the ocean bottom, the co-incidences of certain species with certain bottom types, and the embeddedness of all of these relationships in variably constraining and enabling weather - is that captains attempt to organize with certain nexuses of natural relationships. These nexuses of natural relationships are the natural component of a front-line, once captains attempt to organize their operations in relation to them. Figure 7 below depicts the combination of relationships that forms such a front-line nexus. Table 3 further explores these nexuses of relationships and captains' processes of attempting to organize with them, primarily in terms of the determinacy such relationships can offer captains' sensemaking processes.

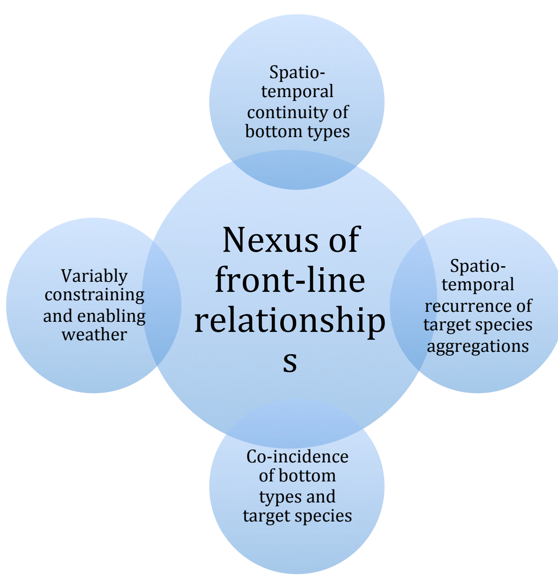

Figure 7: Natural front-line processes as a nexus of relationships

Table 3: Natural relationships as sources of determinacy	**Representative quotes**
Recurring coincidence of target	"There's a couple places that we fish the exact same strip [of bottom] –

species and the coupling of different bottom types	there's a strip where the sand meets the gravel and right in there is where you catch the fish" (fishing trip observation)
Predictable coincidence of target species and bottom depths	*Interviewer:* **"**Where do POP like to hang out?" Captain: "They just slide up and down the bank here, they hang out deeper – they live off of the edge. You get them, like on that coral patch there (pointing to a chart), they go up there sometimes, but they normally they stay outside of 70 [fathoms]. That's where they usually are" (fishing trip observation)
Predictable coincidence between target species and specific bottom areas (born of specific bottom types)	"A pollock net is extremely fragile, and we have two areas that have soft bottom where you can fish. . . There are two areas that produce, and I'm just shooting from the hip, 80% of the pollock here. And typically there is not fish in both areas – if the fish are in one, they are not in the other – they are not in both areas at the same time"
Gateway relationship between weather and organizing with relationships between bottom and target species	*Interviewer:* **"**How much of catch fish is experience and how much of it is technology? *Captain: "*Well, there is some fancier stuff that we don't have that would help, there's Doppler current sounders, there's real fancy stuff to put on your net that we don't have, but a lot of it is experience and luck. But, I've just learned that, after a while you just look back at all the times you ever were really successful catching rockfish, its almost always been when the weather was really good" (fishing trip observation)
Gateway relationship between weather and organizing with relationships between bottom and target species	"Northern rockfish especially, they are in little schools, and you just have to hit 'em, you can't be off. . . If the weather is good, or if I can tow into the weather, then I can usually hit a pretty small spot. But when you are going sideways to the weather the boat has to turn, it makes the gear go goofy. The gear tends the bottom best when its just straight behind the boat. So when you start trying to force your way on to the rockpile, it usually doesnt end good. . ." (fishing trip observation)

3. HOW: MERGING THE NATURAL AND SOCIAL COMPONENTS OF THE FRONT-LINE

The social component of a viable fishing spot is created when captains attempt to organize with specific front-line nexuses due to the predictable efficiencies they may offer a trawl process. The data show that, in the interest of finding a viable fishing spot, Kodiak trawl captains attempt to organize their fishing operations with predictable front-line processes, and, further still, with predictable relationships among predictable front-line processes. But such organizing requires making sense of predictable natural relationships, as one captain describes in the following:

> Nobody knows the ocean floor better than a fisherman. We see, eat, sleep, and breath that ocean on a day-to-day basis. And some days there will be more fish than you know what to do with on a particular rock, and the next 10 days there will be no fish on that rock. And knowing those days and the weather conditions and the things that produce the right conditions to make those fish school up on

> those rocks is something that fishermen spend their whole entire lives trying to learn.

Recurring relationships among variably predictable processes offers captains an ability to create the 'workable level of determinacy' they need to organize with indeterminate systems. I alter the familiar "workable level of certainty" (Weick, 1969: 40) with 'determinacy' to better capture the transformation from indeterminacy to determinacy that sensemaking accomplishes in the name of finding a viable, i.e, profitable, fishing spot. And as the quote above indicates, there are natural and social components of a viable fishing spot: there is "knowing" and there are the "right conditions." In order to know, captains habitually look to past experience in order to understand what is "right" about inherently variable, yet also recurring, conditions at the front-line. Thus, in the Kodiak fleet there is a fleet-level disposition toward fishing the same spots, from which arises identifiable patterns of action. Table 4 below provides practical examples of captains deciding to fish in a spot that they have before.

Table 4: Fishing the same spots	**Representative Quotes**
Strategy of fishing in the same places	"We fish the same spots; for one reason, some of the bottom isn't conducive to fishing. There's fish there, but the bottom's not good and after you have had to repair enough nets, you find out that its not beneficial to go into these places, so you don't go in there. I mean, you got to have pretty good reward to take a big risk. So you've learned that you fish these other areas - fish come in there different times a year, and you fish them."
	"There's only a few places we can fish, and we fish the same places year after year after year, and they are always productive. . . Like Chiniak Gulley, we've been fishing there for 30 years and you can still go out there at certain times of year and just load up in 24 hours on sole flatfish."
	"I know I've made this tow (indicates a place on a chart) 250 different times in my life, and I know that I can go back there and make this tow in a given year in a given circumstances and I will catch the same amount of fish."
	"So if you look at the data, we tow in the same place year after year, for 40 mother fucking years, we are towing on the same edge of Chiniak Gulley or any of our other spots, and we are still going there today. . . If you overlay the data for 40 years, the draggers will be here, here, and here (pointing to areas on a chart), year after year after year."
	"I have fished out there for 30 years. You go to the same place, to the same dot on the chart. The tides come, and within one day you can't find a trace of the trawl, but the fish are there year after year."
Practice of fishing in the same places	*Interviewer:* Is this a tow you have done before? *Captain*: Yeah, you can see all the times I've been through here *Interviewer:* So what influenced you to fish here?

	Captain: Oh it's just where I've caught duskies before, I've done pretty well out there. (fishing trip observation)
	Interviewer: **"**Are these all tows you've done before (pointing to markings on the wheelhouse plotter)?" *Captain*: "These are all fish, where I've towed for duskies. This one (pointing to a mark on the plotter) I think is what I'm gonna try - the last time I dusky fished a couple of years ago I did ok up in there, and then this over here has always been fairly good (pointing to a different mark on the plotter)." *Interviewer: "*So are you typically going to go to where you have gone before? *Captain*: Yeah, or somebody tells you about a spot" (fishing trip observation)
	*Interviewer: "*Why did you chose to fish up there?" *Captain: "*It's just been traditionally a really great spot and we don't have to compete with other groups when we go there. Like this time of year usually its cleanest, winter time is usually the time to fish in Portlock because the halibut aren't there."
	"This my other spot here, as you can see I've made a few tows there, I might go check that out. . . I know they are gonna be there, because that's where they have always been." (fishing trip observation)
	"When we left town, most of the fleet was already out. I talked to them, asked how it was going, half the fleet went to one area, half went to another area. The three boats I control, we all went to the same spot we each went to last year. That's what most people do."

Sensemaking at the front-line of commercial fishing involves moving from generally predictable interrelationships based on past experience to finding a viable specific fishing spot based on current conditions. Finding specific fishing spots within a larger set of past fishing spots, which one captain quantified as numbering in the "thousands," is a process of inquiry that is neither completely deductive, nor completely inductive, but rather is abductive. Abduction is the process of "comparing existing conditions to a relatively simple operating model" (Abolafia, 2010: 353) in order to produce a conjecture or hypothesis in terms of how to operate within those conditions (Harrowitz, 1983; Rescher, 1978; Weick, 2006, 2010, 2012). The abductive process takes abstractions from past experiences in the form of a rule, logic, lesson, scheme, or operating model - something that guides current experience in a deductive manner, and combines them with bracketed cues from concrete circumstances - something that guides current experience in an inductive manner, in the interest of determining what sort of experience to enact next.

According to the concept's initial proponent Charles S. Peirce, abduction is the only kind of reasoning that is 'synthetic' in that it merges the abstract and the concrete parts of experience. As such, according to Peirce, abduction is the only kind of reasoning capable of producing new ideas. To produce new ideas, actors employing abduction undergo a process of "intelligent guessing" aimed at creating hypotheses that are "marked by good sense" (Peirce, 1931-1958, cited in Rescher, 1978: 42). As Peirce (1995: 171) outlines, "deduction proves that something *must* be; Induction shows that something *actually is* operative; Abduction merely suggests that something *may be.*" And, as noted in the Introduction, the problem of what may be, or what may come next, "is perhaps the fundamental problem of ordering and organizing" (Cooper & Law, 1995: 242). Captains merge past experience with cues from current conditions, under the guiding hand of desired future experiences, with the present modifying the past and the future modifying the present, from which they produce a conjecture of a place to fish – a sense of what to do next. Abduction is the primary method captains use to make sense of what comes next at the front-line of commercial fishing.

What it means to be 'abstract' and 'concrete,' however, requires some elaboration. 'Abstract,' as it is used here, refers to things that are "comprehensible without reference to some one particular occasion of experience. To be abstract is to transcend particular concrete occasions of actual happening" (Whitehead, 1925: 159). Whenever someone says, "there it is again," abstractions are the things that can "be again" (1919: 144). In being again, according to Whitehead, abstractions "have analogous or different connections with other occasions of experience" (158). As common parts of different occasions of experience, abstractions function to render one occasion relatable to another. Thus, to be concrete is to be a particular event, occasion, or bracketed portion of experience that is never to 'be again.' A particular codfish is never to 'be again,' but its name, the category into which a bracketed entity is merged, will 'be again' many times over. Similarly, a fishing spot defined by a certain geophysical formations or its appearance on a chart created by contour lines (notables include Perch Mountain, The Butt Cheeks, Mr. Potato Head, The Coral Patch) or by a certain latitude and longitude, can 'be again,' but the particular conditions encountered there and the tow enacted there cannot 'be again.' And, just as 'past' and 'future' are relative terms in that we cannot know one without the other, 'abstract' and 'concrete' are relative as well. We cannot know what is abstract without reference to some concrete aspect of experience, and we cannot know what is concrete without reference to some abstract part of experience. Thus, the interrelated abstract and concrete describes a dimension of experience. As Hernes (2008: 57) states, "The dimension of concrete experience versus abstraction captures a central activity of organization." It is demonstrated here that this dimension captures a central activity of front-line sensemaking.

The processes analyzed here are abductive approximations of the future in the present, based on the past. The future is read through the past, in the present, the product of which is sense of what to do next. Thus, the interrelational dimension of time is also a key constituent of these processes. These processes are 'sensemaking events' consisting of connecting the abstract with the concrete and the past with the future, in the present, guiding the transition of the present into the past, and the future into the present (see Figure 8). These sensemaking events act as a sort of vector in that they move actors further along in an organizing process by producing a conjecture of what to do next. The horizontal arrows in Figure 8 represent the Janus-faced, retrospective and prospective nature of a sensemaking (Gioia & Mehra, 1996; Stigliani & Ravasi, 2012; Weick, 1979, 1995), and the vertical arrows represent sensemaking as a process of connecting the abstract and the concrete (Jeong & Brower, 2008; Mills, 2003; Weick et al., 2005). Thus, there are four dimensions of this process - past, present, abstract, and concrete. These are parts of the process as a whole, which are capable of conceptual separation into relative terms or dimensions. Thus, there is always an abstract part of sensemaking in relation to a concrete part, and there is also always a future part in relation to a past part. Yet these parts are also inseparable in that what is abstract is imported from the past and/or the future, while what is concrete is always ongoing part of experience - it will never 'be again.' But what is concrete modifies what imported from the past and future, and what is past and future influences what is seen in concrete experience.

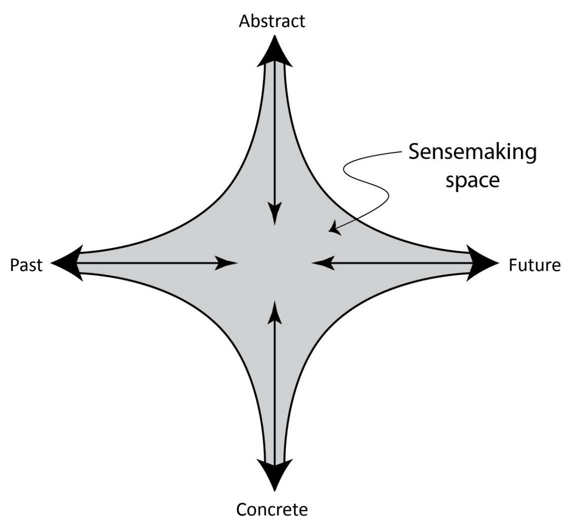

Figure 8: The abductive sensemaking event

The elements of the past, future, abstract, and concrete considered in producing a conjecture together create the 'sensemaking space' within that event.

4. ILLUSTRATION: SENSEMAKING AT SEA

Relationships among certain natural processes form a recurring, predictable nexus that captains, with the goal of profitable fishing, attempt to organize with. Captains accomplish this organizing from which a front-line emerges by merging past experience—including locations and times of past profitable fishing events—with current conditions, in order to produce a conjecture regarding where a similar event could be enacted again. These mergers are sensemaking events. Yet, sensemaking at the front-line of commercial fishing is not a one-off event - events are distributed through time and across space. This section applies the model constructed above, demonstrating that a front-line sensemaking process is composed of interlinked sensemaking events. Hernes (2008: 45) theorizes a similar point:

> Events *make* processes, and they can make processes only by connecting to other events. Also, they can make up processes only by embodying the past, the present, and the future. . . In this lies an inherently process view, however difficult it may seem for practical research.

This section offers empirical evidence for the constitutive relationship between temporally linked sensemaking events and sensemaking processes. Furthermore, the analysis provides a mechanism through which events are linked across time and space into processes: the objectified output of one serves as abstract input to another.

To provide this illustration, I track the progression of one captain's fishing processes as he moves from a. Making sense of where to fish in general in terms of choosing a fishing spot to steam to; to b. Making sense of where to fish in particular in terms of which aggregation to fish from; to c. Making sense of the catch after fishing in terms of whether he will continue to fish in the same area, or move. Together these stages feed into this captain's determination of whether to fish in the same spot or move to a different spot. Each of these sensemaking stages corresponds to a section of the findings below. While one captain's fishing process anchors this discussion, lessons taken from this captains process are heavily informed by sensemaking processes both observed among and described by other captains in interviews, on fishing trips, and in fleet meetings.

a. Making sense of where to fish in general

Heading out to fish sets in motion a series of interlinked sensemaking events, which ultimately lead to a determination of where to fish *next*, but which along the way produce a determination of where to fish *first*. This section focuses on the part of this process that encompasses events through which a captain determines which fishing spot to go to first. As I noted above, we are tracking one captain's sensemaking process during a trip in which he targeted flatfish. Our captain began the trip with the following proclamation:

> If we can go out and [the crew is] making $500 a day, I don't care what we are catching. But if they can't make that, we might as well be tied up. There's lots of days we aren't fishing and we don't make anything, so a $500 day counts for the three days you did nothing.

This proclamation is the creation a rule of economic viability, which is meant to influence the construction of all fishing activities on the ensuing fishing trip. Thus, the rule states that any choice of a fishing spot must contribute to an ability to produce a crew pay rate of $500/day. This pay rate is known as a 'crew share.' Inherent in a proclaimed specific crew share of $500/day is the captain's *a priori* understanding of the overhead costs of operating the vessel on that trip, including fuel, food, and fisheries observers. The 'viability' aspect of this rule is signaled by the phrase "if they can't make that, we might as well be tied up." As a manager of the trip's profitability, and therefore the crew's income, the captain's ultimate goal is to, legally and safely, catch enough fish to pay the trip's overhead costs, while also creating enough profit to pay the crew share of $500/day.

A structural analysis of this event, based on the abductive sensemaking model constructed in Figure 9, is diagramed below. The captain's production of sense starts with his knowledge of the overhead costs of similar trips, which he distills from numerous past fishing events. The concrete aspects of this particular trip, such as target species, likely weather conditions, likely bottom type, and how far the fishing grounds are, influence what he believes the overhead costs of this particular trip will be. Thus, concrete conditions influence which past experiences he will use to inform this sensemaking event (arrow #1). From this selective influence of concrete conditions on past experiences, the captain imports particular past experiences into this event (arrow #2), noted in Figure 9 as 'Applicable overhead costs for the trip.' The captain's selection of overhead costs for the trip is abstract in that it is derived from past events; these overhead costs exist beyond any one trip the moment they are used in subsequent trips. In Whitehead's language, this selection of overhead costs is an object that has 'been again,' while the concrete aspects of a particular trip, composed of cues extracted from the nexus of natural processes the captain will attempt to organize with, will never 'be again.' The outcome

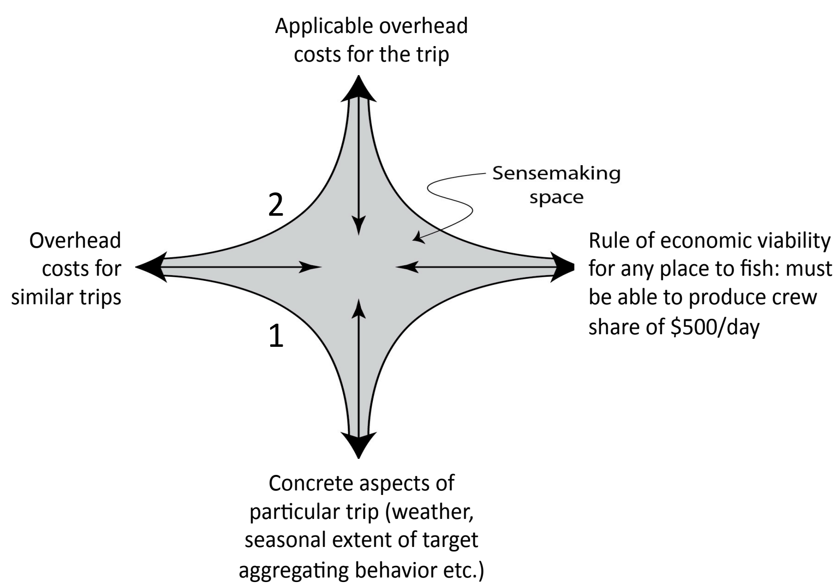

Figure 9: Making a rule to guide the sensemaking of the economic viability of subsequent fishing events on this trip

of the merger of the four poles of this event, under the guiding hand of the captain's crew share goal, is a rule for the economic viability of any fishing event on that trip. The captain is making economic sense of the trip as a whole, and in doing so produces a rule meant to guide particular events on that trip. Thus, the rule is designed to 'be again' when he must make sense of where to fish and what to fish from. The captain made sense in the present, *for* the future, using the past.

b. Making sense of where to fish in particular

The previous section elucidated a process through which our captain structured his process of determining which fishing spot to steam to. This section examines a process in which the captain structures his determination of which particular aggregation to fish from, or, as captains state, 'set on.' After reaching the fishing grounds, captains confront an *actual* front-line nexus of natural relationships rather than, what has been up to that point, *potential* front-line nexus of natural relationships. At this point captains make sense of whether a particular aggregation embedded in a nexus is a viable option in terms of enacting a profitable fishing process. Upon reaching his selected fishing grounds and attempting to determine exactly where to set out his gear, our captain imported his rule of economic viability form a previous sensemaking event into the following sensemaking event:

> We need to catch about 10 thousand pounds an hour to make a living doing this. If you average out all the species [we will catch here that we can sell], the sole, arrowtooth, and skates, we are doing this for about 10 cents a pound. I figure if these guys can make $500 a day, it's worth it - that $500 makes up for days when they don't make anything.

Figure 10 below diagrams the sensemaking event through which this captain produced a catch rate goal of 10 thousand pounds per hour. This goal is derived from a merger of his rule of economic viability and the potential value of the fish he will likely catch in that particular area. The cues he extracted from his current context are concrete in relation to the imported rule of economic viability, which is abstract in relation to those concrete cues. The product of this

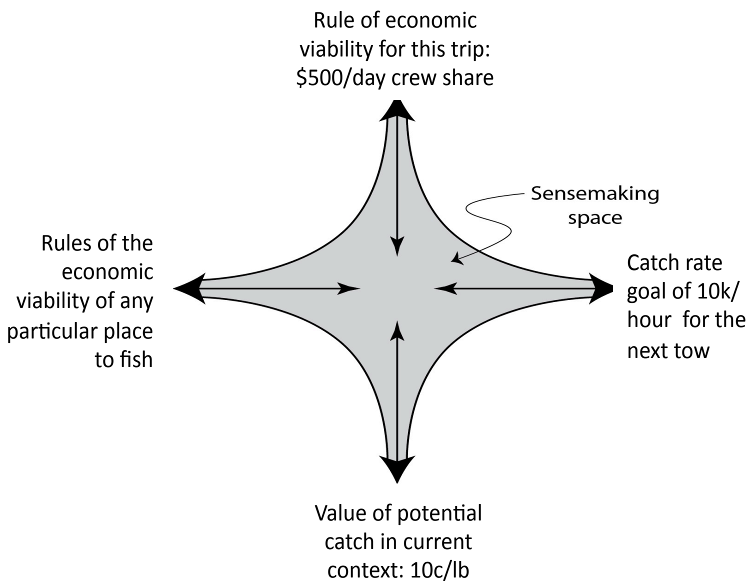

Figure 10: Making sense of a catch rate goal, using the previously produced rule of economic viability

merger is another structure meant to guide ensuing fishing processes in this particular fishing spot. This structure is a rule of how much the vessel needs to catch to meet his threshold of economic viability. This event again exemplifies the captain making sense in the present, yet for the future. This event also exemplifies how sensemaking events are linked through abstractions, here the rule of economic viability, yet not necessarily linked by time in terms of one event being immediately before or after the other.

2. Making sense of where to fish next

Once captains have set on a certain aggregation, filled their net with it to whatever degree they can, and hauled the catch on board, captains must make sense of what they caught. The previously indeterminate is now ready for nearly full determination. In embarking on such a determination, captains first make sense of how much fish they have caught - the haul's catch weight. Captains do this by employing knowledge of how much the codend holds and comparing filled codend with empty codend; or, captains employ their knowledge of how much their fish hold holds and comparing occupied fish hold to empty fish hold; or, captains simply look at the catch sprawled on the trawl deck and, drawing on years of experience, estimate a weight. The particular mental model captains use is dependent on the fishery in which they are fishing. Taken together, captains merge their perception of concrete catch with an abstract mental model, from which they produce a catch weight. The catch weight is a new object in the captain's experience. This new object feeds into a subsequent event, which is the determination of that tow's catch rate. To construct the catch rate, captains pair their sense of the weight with another factor of the tow – the time it took to catch the fish, creating another object - a certain amount of catch through a certain period of time in that fishing spot. This object in turn will feed into subsequent sensemaking events. An event signaling the construction of the catch rate can be seen in the following conversation with the our captain:

> *Interviewer:* How much fish do you think that is (looking at catch emptied onto the back deck)?
> *Captain:* Oh, about seven thousand pounds. This tow only paid for itself. We had four hours invested in that tow, we have to do better than that.

In this discussion, the captain merged the catch weight ('seven thousand pounds') with the

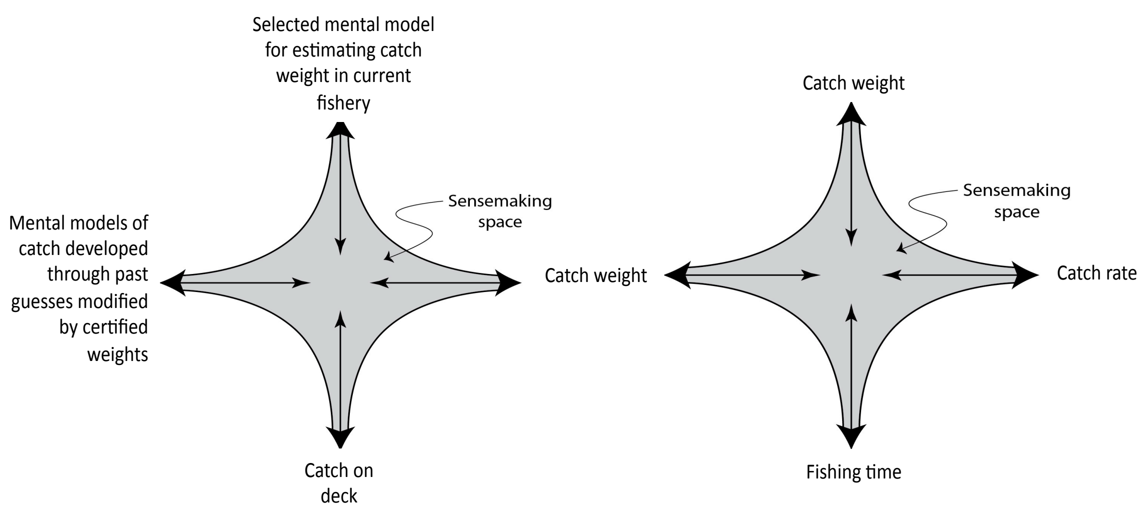

Figure 11: Sensemaking process for producing a catch rate after producing actual catch

amount of time that passed while catching it ('four hours'), to produce the tow's catch rate. This production was an abduction in that it consisted of merging a relatively abstract factor of experience with a relatively concrete factor of experience, the purpose of which was to bring a new idea into experience. The catch weight was abstract relative to the time it took to catch it because, while the accruing catch would ‘be again’ through the moments that passed as it was accumulating in the net, the actual moments would never ‘be again.’ Figure 11 depicts the interlinked process of the two sensemaking events of creating the catch weight and the catch rate. These two events are joined by an output from one (catch weight), which is an input to the other. The outcome of the second event is the catch rate, which, like other outcomes of sensemaking events diagrammed above, is a structure that will guide future sensemaking.

Yet, in addition to producing a catch rate of the most recent tow in the previous conversation, which is a retrospective construction, our captain, in the same breath, projected that construction prospectively. In making sense of what happened, he began to make sense of what to do next. After hauling back a tow, and assuming the vessel is not full, a captain must decide to either “throw it back out” in the same spot or move to a different spot. In stating, “we have to do better than that,” the captain hinted at his sense of a relationship between one event and another event: the past tow and the next tow. This sense is possible because the catch rate, now an abstract object, relates the two events. The catch rate for the past tow allows the captain to predict the catch rate for the next tow, if he fishes in the same (yet ever-changing) nexus of natural relationships. Thus, now that he as an actual catch rate for a certain fishing spot, he can, with greater predictability, project the future into the present and conjecture what his catch rate will be *before* he tows again in that spot. This additional conjecture is diagrammed below (Figure 12), carrying forth its relationship to the two events diagrammed in Figure 11. In this event, the

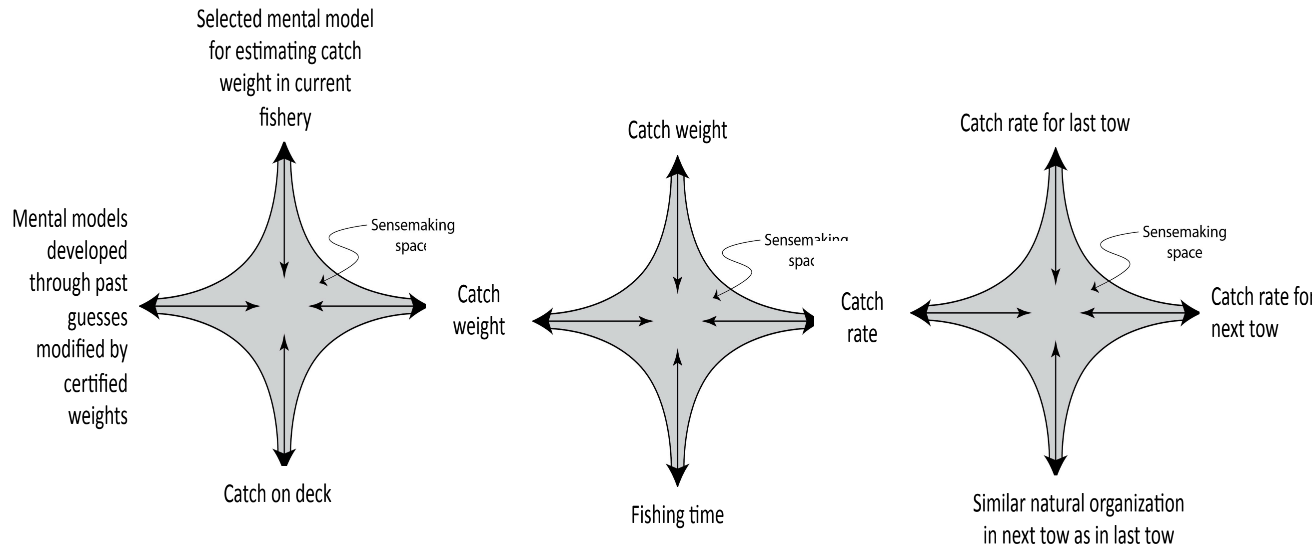

Figure 12: Sensemaking process for conjecturing the catch rate of the next tow (incorporating the sensemaking process from Figure 11)

captain merges catch rate for the last tow with his sense of what the natural conditions would be if he towed there again, to predict the catch rate for the next tow. It is from this implicit abduction that the captain, perhaps drawing on his previous sensemaking in which he produced catch rate goal (i.e., 10 thousand pounds an hour), and/or his rule of non-viability (i.e., six, seven, eight thousand pounds), both of which this tow failed to meet, created a sense of the need to update the conditions of the next tow in order to “do better” than the last tow. Alternatively, if the potential catch rate for the next tow satisfied his rules for an economically viable fishing process, if the relationship between aggregation and ocean bottom remained viable for towing, and if the weather has not rendered fishing then and there unviable, the captain would likely stay in the same spot, for moving costs both fuel and time. Our captain decided to update his potential catch rate by moving to a different spot in order to “do better” than he did in the previous tow. The upshot is a diagram demonstrating how sensemaking events are interlinked by abstractions into a sensemaking process.

DISCUSSION

The research question that motivated this study was, how do managers organize at the front-line of a natural resource extraction industry? The findings show that when captains set out to fish, they set out to organize with recurring nexuses of natural relationships, for doing so with trawl gear offers "a workable level of certainty" (Weick, 1969: 40) that their process will be efficient in terms of both vessel operations and prohibited species bycatch. Yet, captains may have certainty in terms of what they *want to* fish from, but they do not yet have determinacy of what they will *actually* fish from. Captains seek an aggregation of target species they can profitably tow from, which is associated with a bottom type they can profitably tow on, in a weather system they can safely tow in. Thus, captains attempt to organize their fishing operation with natural organization of ocean bottom, fish aggregation, and weather. The recurring nature of front-line interrelationships disposes them to being predicted when overlaid with past experience. Thus, a primary means of determining where to fish is accomplished by merging past experience, in the form of abstract knowledge of system characteristics or past fishing events, with current conditions in order to conjecture what to do next.

Captains start the process of determining where to fish by employing a certain mode of sensemaking: fishing where they have fished successfully before, modified by current conditions. This mode of sensemaking is a disposition for recurring natural relationships that is characteristic of Kodiak trawl fishing processes. Captains may fish in different places than they did previously, or they may fish in the exact same areas, but how they alight on a certain spot is a product of the day-to-day, rote mechanics of sensemaking in this particular natural resource industry, which is enabled by and dependent on nexuses of recurring natural relationships. Thus, the pairing of abductive mode of sensemaking that is characteristic of the Kodiak trawl fleet with recurring nexuses of natural relationships are the interpenetrating processes from which front-line in the commercial fishing context emerge.

The second portion of the previous analysis traced the sensemaking that was part of the infrastructure of one captain's fishing process as he moved from making sense of where to fish, to making sense of what to fish from, to making sense of his catch. At each of these stages the captain's sensemaking was nestled between the actuality of the past and the potentiality of the future; within this space, the captain drew on past experience as he told a story of what was happening and conjectured what to do next in light of his goals. The culmination of these sensemaking stages was the captain's production of a sense of whether to continue to fish in the same spot or to move to a different spot, and in doing so enact a different nexus of natural processes to fish in.

Key Findings

Beyond this broad summary of the findings detailed in this study, three interrelated key findings stand out from the previous analysis: 1) captains make sense of missing, hidden, or unknowable cues through abductive sensemaking events; 2) captains create objects in the present that are designed to influence sensemaking in the future, which enables them to manage how their front-line organizing process unfolds; and 3) sensemaking events are linked across time and space, suggesting a distributive model of abductive sensemaking events. The following discusses these key takeaways in greater detail.

1. Abductive sensemaking events The fishing captain leaving the dock is presented with a vast ocean of possibility in terms of where to fish. The captain's task is to abduct a particular place to fish by merging past experience and concrete conditions, thereby forging a workable level of determinacy in terms of a specific aggregation to fish from. Similarly, as philosopher of science

Nicholas Rescher explains, “The task of abduction is to determine a limited area of promising possibility within the overall domain of theoretically available opportunity, a region which is at once small enough for detailed examination and research, and large enough to afford a good chance of containing the true answer” (Rescher, 1978: 42). For a fishing captain, the ‘true answer’ is a fishing spot, composed of interrelated ecological, geological, and atmospheric processes, that contains within it the opportunity to make his fishing process a profitable one. The analysis above shows that captains find a profitable place to fish by taking past experience, captured in abstracted events, as well as in more general knowledge of natural processes, such as geology or target species life history traits, and merging it with cues bracketed from concrete experience, such as interrelated ecological, geological, and atmospheric processes. This approach is a strategy of abduction.

In terms of the broader relationship between abduction and sensemaking, sensemaking scholars have addressed abduction in several ways. Scholars have theorized about the overlap between abductive modes of inquiry and sensemaking (Maitlis & Sonenshein, 2010; Weick, 2006, 2010, 2012), they have used an abductive lens to interpret data (Cunliffe & Coupland, 2012; Kramer, 2007), and one has explicitly studied the abductive processes that organizational actors themselves enact (Abolafia, 2010). In addition, scholars have implicitly studied various forms of abductive processes, such as constructing ‘detective stories’ by merging plots and clues (Patriotta, 2003), employing metaphors to merge individual accounts and societal expectations (Cornelissen, 2012), and using stories to make sense by ‘relating the particular and the universal’ (Islam, 2013: 34). The overlap of abduction and sensemaking, however, is perhaps most apparent in discussions of the basic structures of each. In terms of abduction, Harrowitz (1983: 190) demonstrates that abduction merges an observed fact with an explanatory rule, in which ‘the observed fact is read through the rule' to produce a new understanding, idea, or 'case.' Similarly, Schruz (2008: 205) characterizes abduction as consisting of the merger of 'beliefs or cognitive mechanisms which drive the abduction' with 'evidence which the abduction intends to explain,' which produces a hypothesis or conjecture. And Weick (2012: 149) formulates abduction as "cue + frame + connection," from which order is produced. Meanwhile, the basic conceptual structure of sensemaking bears a striking resemblance: Weick et al. (2005: 410) state, "To make sense is to connect the abstract with the concrete," while according to Mills (2003: 53), "In essence, everyday sensemaking involves a frame, a cue, and a connection;" and, as Jeong and Brower (2008: 230) state, sensemaking is "a kind of combining process in which the cue is connected to a frame of reference, through which a state of affairs (meaning) of the cue is constructed." Both the abductive and sensemaking process concerns merging the abstract with the concrete, from which some form of sense, be it a conjecture, hypothesis, or idea, is produced. It is clear that abduction is a core process with larger sensemaking phenomena.

2. Sensemaking structures for managing organizing Scholars state that sensemaking processes concern answering the questions, "What's the story here" and 'What's next?' (Weick, 2003; Weick et al., 2005). Captains, having one eye cast toward what is happening, another eye cast toward what might happen next, and a head full of applicable past events and desired future events, continually attempt to manage the transition from what is happening to what will happen next. A means by which captains manage this transition is by actively making sense *for a* specific future rather than, or in addition to, passively making sense *of the* future. The findings demonstrate that at different stages in their fishing processes, captains make sense for a specific future by creating objects (e.g., structures, rules, descriptors) in the present that are meant to influence or inform future sensemaking when specific events come to pass. In doing so, they influence how that future event transitions into a subsequent event. Examples include the rule of economic viability meant to guide the choice of a particular place to fish, as well as the rule of non-viability meant to guide a determination of whether to continue to fish in the same spot or not. These objects were all born of a story of what was happening, and were intended to aid or influence a determination of what to do next when certain events arrive. Furthermore, an appeal of such objects is that they serve as shortcuts for sensemaking in future events. In processes in which the past and future are contemporary constituents of the present, a determination of 'what the story is now' and of 'what's next' are relative - one is only known in terms of the other. For example, when a captain creates a rule prior to fishing that a certain catch rate must be maintained in order to continue to fish in a certain spot, his determination of the actual catch rate once the catch is hauled on board is both a story of what has happened while it also predetermines, based on the rule produced in the past, what should happen next. Captains not only produce a rule or structure in one event that influences sensemaking in a future event, but it may also act as a shortcut for making sense in that future event. To aid their ability to manage the progression of their organizing process, captains create sense in the present that is meant to shape their sensemaking in the future, perhaps acting as a shortcut for such sensemaking, in turn impacting how events unfold and the nature of the organizing from which a front-line emerges.

Another way to conceptualize the process that emerged from these findings is that actors engage in self-sensegiving. Sensegiving is a variant of sensemaking in which actors perceive or anticipate a gap in the sensemaking of others, and attempt to strategically fill it (Maitlis & Lawrence, 2007: 78; Gioia & Chittieddi, 1991). This study demonstrates that the effort to sensegive may be aimed at a perceived gap in one's own proximate or distal sensemaking, as well as in another's. For example, the rule of the non-viability of continuing to fish in the same spot serves to influence how an anticipated gap in one's own future sensemaking is filled. The implication is that sensegiving, and sensemaking more broadly, should be conceptualized in terms of being distributed across events rather than from one person to another.

3. The temporally and spatially distributed sensemaking model The fact that sense produced at one time can be picked up at another time, or projected into another time, suggests that sensemaking events are connected by sense, in whatever form it may take, as it is abstracted from one place and time and transmitted into another place and time. Hernes (2008: 131) puts it this way: "We notice things as we act, and the sense made of what was noticed forms a basis for what is done next." Yet, the findings here show that what is next may be proximate in that it closely follows an event or distal in that it occurs at some later time. Sensemaking events are

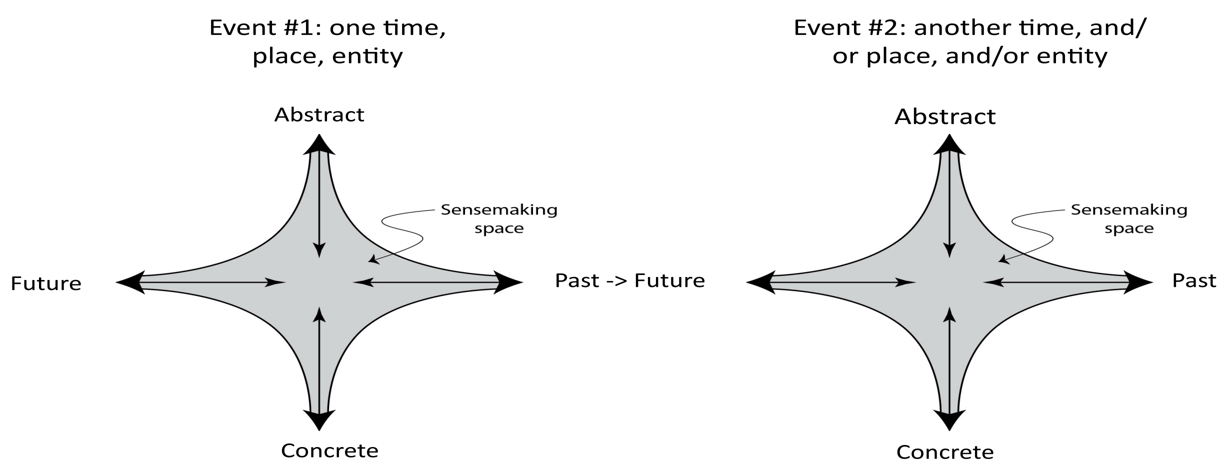

Figure 13: Generic concatenating model of sensemaking

linked *through* time, not necessarily *by* time in that the output from one event serves as an input to a future event, but not necessarily the next event. Figure 13 depicts the generic structure of this model, in which events may be sequential, one happening right after another, or one event may occur at one time after which it may be objectified, picked up and used to structure an event at an altogether different time. Furthermore, events may occur within the same space, exemplified by the captain making sense of his catch, or events may be connected across space, exemplified by the same captain making sense before heading to a particular spot and after arriving at that spot. The model above encompasses both sensemaking and sensegiving, proximate and distal temporal, and spatial relationships between events. In addition, this model emphasizes abstractions, rather than people, as that which connections one event to another. Abstractions from the production of sense in one event serve as inputs to other productions of sense, where they are taken up and enlarged as they are combined with different concrete cues and perhaps other abstractions from other past events. The general model below a tool for examining the abstract, concrete, retrospective, prospective, as well as the continual and episodic nature of sensemaking.

Theoretical implications

The previous discussion summarized this study's findings, while also discussing key takeaways. The following discusses the theoretical contributions of this study in terms of 1) the emerging dichotomy in the literature of sensemaking as either episodic or continuous; and, 2) the relationships between sensemaking events and clock and event time. The remainder of the discussion is devoted to an examination of practical implications and areas for future research.

1. Episodic vs. continuous sensemaking Thus study demonstrates that sensemaking processes, composed of interlinked sensemaking events, help captains 'know before they tow.' This finding addresses an emerging tension in the sensemaking literature that concerns different conceptualizations and assumptions of sensemaking's processual nature. As Weick (2012: 146) describes, "The tension is generated by the question, is sensemaking episodic or continuous?" Does sensemaking "start with chaos" (Weick et al. 2005: 411) or does it "never start" (Weick 1995: 43)? Does sensemaking begin with the shock of ambiguity or equivocality and end with a good story (Weick, 1995)? Or, is sensemaking always ongoing (Hernes & Maitlis, 2010; Weick

1995)? The answer that this study offers is, yes - to both. Sensemaking, in both relying on inputs from past events across space and time, and functioning to project outputs into other events across space and time, operates in fits and starts. Yet, these fits and starts are always occurring. The findings demonstrate that the way in which sensemaking events are interlinked into a continual process is through abstractions, which can extend across time and space.

2. Sensemaking-based time While the literature demonstrates a clear connection between sensemaking and abductive processes, primarily in terms of the dimension of the abstract and the concrete, the other dimension of the sensemaking events analyzed in this study, past and future, is missing from current conceptualizations of the abductive core of sensemaking. Time as a factor in organizing processes is an emerging interest among organizational scholars in general (e.g., Ancona, Okhuysen, & Perlow, 2001; Butler, 1995; Czarniawska, 2004; Orlikowski & Yates, 2002), and among scholars concerned with natural aspects of organizations in particular (Bansal, 2005; Slawinski & Bansal, 2012). This study provides further evidence that events are not necessarily linked through clock time (or as it is known in Greek, *chronos*) but rather through the meanings they acquire through time, which is called "event time" (known in Greek as *kairos*) (Slawinski & Bansal, 2012). Furthermore, if events are linked by clock time, such linkages are often secondary to their linkage through event time. Yet, this study contributes to the literature on organization time by offering a mechanism for *kairos* - the objectification/abstraction interlinking of events, which may be either accomplished passively or intentionally by creating structures meant to influence future sensemaking.

Future Directions

An obvious next stop is expanding the model provided here from the individual level to the dyad, group, or collective level. It is apparent from my data that one of the primary means of making the unknown known, or indeterminate determinate, is seeking pre-experiential guidance from another captain. The other captain may have just fished the same aggregation, or he may have fished a certain spot in the more distant past. One captain copies the tow another captain made in order to catch a similar amount and type of fish. The information the one captain gets from another offers as workable level of both ecological and economic certainty. The process would appear to work much the same that abstracting an event from one's own experience does. But does it? Communication as a conduit for the transfer of sensemaking vectors introduces variables into the process that are not present at the individual level. Issues of in-group/out-group, identity, and trust come to the fore. In addition, the extent to which a vector is shared is potentially beholden to the (abstract) quota allocation structure in the fishery in which captains are operating, as well as the (concrete) nature of the ecological processes from which they are extracting.

Practical Implications

Bycatch is widely considered a major threat to marine ecosystems and the human economies that rely on them (Abbott & Wilen, 2009; Patrick & Benaka, 2013). Defined as anything that is caught and not retained for sale or personal use (NMFS, 2006; Patrick & Benaka, 2013), bycatch is a product of complex, diverse ecosystem processes and the partially blind extraction of materiality from them. One of the primary ways that regulatory bodies attempt to reduce bycatch is to regulate outcomes in the form of amount of allowable bycatch of certain species (e.g., prohibited species). In Alaska, regulators commonly impose or lower bycatch limits, assuming that the system will adjust to accommodate those outcomes without an incapacitating loss of income. The emphasis is on 'decision points,' and it is assumed that the construction of 'correct' incentives, along with the dissemination of 'accurate' information, will result in the ‘right’ outcomes (e.g., Ostrom, 2009; Yandle, 2003, 2008).

Rational actor assumptions pervade the fisheries management literature and fisheries regulatory processes. Yet, rational theory-based frameworks have been recognized as fostering an incomplete understanding of natural resource management (Holland, 2008; Jentoft & McCay, 1995; Salas & Gaertner, 2004). Fisheries scholar Daniel Holland describes this gap in the following: “When modeling fishing decisions, there should be more explicit consideration given to how fishermen incorporate information into complex decisions, and how they actually make decisions. . . If our goal is to understand and predict fishing behavior and design more effective fishery management tools, it is critical to understand how fishermen actually make decisions, not how economic theory suggests they should make them” (2008: 342). Sven Jentoft makes a related but slightly different point: “We should not only be looking for causal factors external to the individual actors involved, but also to the motivations that guide their behaviour and the interpretations and meanings they attribute to the particular circumstances that they find themselves in and the choices they make” (2006: 678). Current research and regulatory processes overlook a great deal of the behavioral, interpretive, and social processes of effective fisheries management (Carlsson & Berkes, 2005; Hilborn, 2007; Plummer & Fitzgibbons 2004). This study offers a way of understanding the interpretations and meanings that feed into front-line management behavior, while not relying on rational actor models and assumptions. In doing so, we can better understand how fishermen actually manage their operations. Only then can we enable them to better manage their operations so that improved ecological outcomes do not come at a cost to economic outcomes.

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